[preprint]aastex

Locally Optimally-Emitting Clouds Korista et al. document

# Locally Optimally-Emitting Clouds and the Variable Broad Emission Line Spectrum of NGC 5548

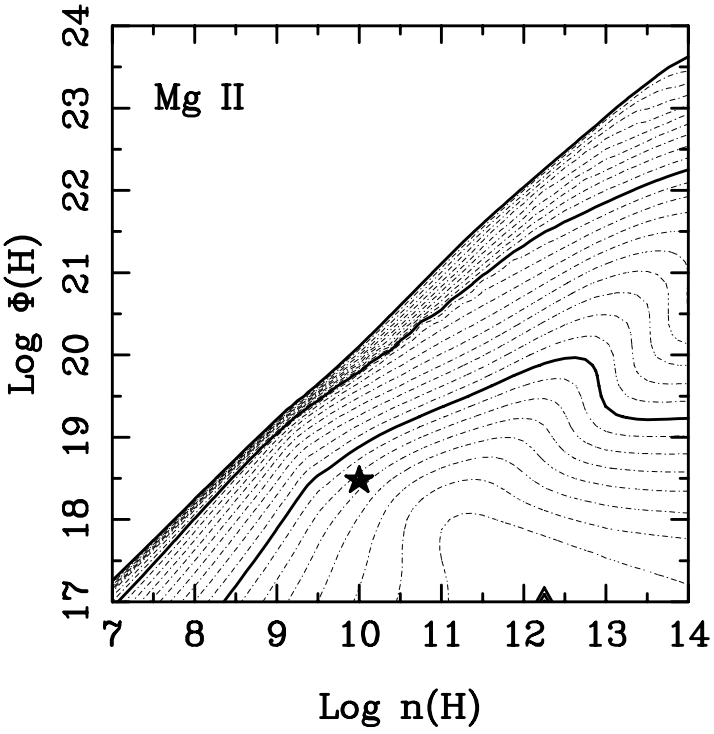
Kirk T. Korista1,2 Department of Physics, Western Michigan University Kalamazoo, MI 49008 korista@wmich.edu

Michael R. Goad3 Department of Physics and Astronomy, University of Leicester University Road, Leicester, LE1 7RH, England, UK mrg@star.le.ac.uk

1Department of Physics & Astronomy, University of Kentucky, Lexington, Ky 2Visiting Researcher, School of Physics & Astronomy, University of St. Andrews, Scotland 3School of Physics & Astronomy, University of St. Andrews, Scotland

abstract In recent work Baldwin et al. proposed that in the geometrically extended broad line regions (BLRs) of quasars and active galactic nuclei (AGN), a range in line-emitting gas properties (e.g., density, column density) might exist at each radius, and showed that under these conditions the broad emission line spectra of these objects may be dominated by selection effects introduced by the atomic physics and general radiative transfer within the large pool of line emitting entities. In this picture, the light we see originates in a vast amalgam of emitters, but is dominated by those emitters best able to reprocess the incident continuum into a particular emission line.

We test this "locally optimally-emitting clouds" (LOC) model against the extensive spectroscopic data base of the Seyfert 1, NGC 5548. The time-averaged, integrated-light UV broad emission line spectrum from the 1993 HST monitoring campaign is reproduced via the optimization of three global geometric parameters: the outer radius, the index controlling the radial cloud covering fraction of the continuum source, and the integrated cloud covering fraction. We make an ad hoc selection from the range of successful models, and for a simple spherical BLR geometry we simulate the emission line light curves for the 1989 IUE and 1993 HST campaigns, using the respective observed UV continuum light curves as drivers. We find good agreement between the predicted and observed light curves and lags — a demonstration of the LOC picture's viability as a means to understanding the BLR environment. Finally, we discuss the next step in developing the LOC picture which involves the marriage of echo-mapping techniques with spectral simulation grids such as those presented here, using the constraints provided by a high quality, temporally well-sampled spectroscopic data set.


Mg II
Log Φ(H)
Log n(H)
17
18
19
20
21
22
23
24
7
8
9
10
11
12
13
14